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Design of an Interlocking Plant at Champaign, Illinois

Civil Engineering
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DESIGN

OF AN

INTERLOCKING PLANT

AT

CHAMPAIGN, ILLINOIS

BY

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THESIS

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This is to certify that the thesis prepared under the immediate direction of Instructor R. I. Webber by

ALOYS PHILLIP POIROT

entitled DESIGN OF AN INTERLOCKING PLANT AT

CHAMPAIGN, ILLINOIS

is approved by me as fulfilling this part of the requirements for the Degree of Bachelor of Science in Civil Engineering.

Ira O. Baker

Head of Department of Civil Engineering

INTRODUCTION.

The present amount of traffic on the Illinois Central and Big Four Railways renders an interlocked crossing an absolute necessity.

The plan presented in this design provides a system of interlocked signals so located that traffic past them will be facilitated and absolute safety to the trains will be guaranteed.

DESCRIPTION OF CROSSING.

The Peoria and Eastern Division of the Big Four Railway, and the Champaign Spur of the Wabash Railroad cross the Illinois Central

Railroad in Champaign Ill. at a point about 1500 feet from each of the three depots. The roads are on an eight foot embankment, have level grades, and cross at approximately right angles.

The Illinois Central is a double track road, and runs approximately north and south at the crossing. The trains on this road are operated on the right hand track. Two cross-overs connect the main track of the Illinois Central; one about 80 feet north, and the other, about 1600 feet north of the crossing. The switch points of the first crossover are between the home signal and the crossing, hence they are operated from the tower;

while those of the more distant, cross-
over, being in advance of the home
signal, are not operated from the
tower, but are interlocked with the
distant signal. There are two side
tracks in the immediate vicinity
of the crossing. One leads north from
the north-bound main track and be-
gins 290 feet north of crossing; the
other leads south from the south bound
main track, and begins 85 feet south
of the crossing. The first of these side
tracks is not operated from the tower,
because it is located beyond the
home signal; but the second being
inside of the home signal is included
in the plant. There are several switches
leading from the siding south of the

crossing, but none of these are within such distance of the crossing that the law requires them to be interlocked. The transfer tracks connect the Illinois Central south-bound main track with the Big Four and the Wabash. The switch points of these are respectively, 736 feet north and 453 feet south of the crossing. The switch points of the transfer track connecting with the Wabash are operated from the tower, but those of the transfer track connecting with the Big Four are locked in connection with the distant signal, since they are in advance of the home signal

The Big Four is a single track

road. I. C. has no secondary track that require interlocking owing to the slow speed at which the trains run in the vicinity of the crossing no distant signals are required.

The Wabash is a single track road which parallels the Big Four near the crossing, the distance between them being about 75 feet. With the exception of the transfer track, connecting the Wabash with the Illinois Central, there are no side tracks which are close enough to the crossing to require interlocking

INTERLOCKING MACHINE

The National Interlocking Machine, manufactured by the National Switch

and Signal Co., is used in this design. All parts of the machine by which locking is accomplished are carried on the main frame underneath the floor, nothing but the levers being above the frame. The rocker is suspended underneath the frame, and is moved by either raising or releasing the latch rod. The rocker is connected to a tappet bar by a link, and can not be moved unless the locking dogs, carried in frame behind the tappet bars, are in such a position as to permit a movement of the tappet bar. The locking is effected by means of the locking dogs which move at right angles to and fit into the notches in the sides of the tappet bars. The

dogs are made of small steel plates, tapered at the ends, and are longer than the distance between any two tappet bars, so that one tappet can not be moved unless the notch in the other tappet is in such a position that the dog is free to move. The width of each of the connecting bars is a little less than one third the width of the dog; so that, when the bars are fastened to the top, middle, and bottom of the dogs, three connecting bars can be arranged to work in one sliding space. In this way a large amount of locking can be accomplished in a small space, and at the same time all parts are readily accessible for cleaning and repairing.

SIGNALS

The signals are of the semaphore type and are so constructed that they will go to the danger position by force of gravity in case any of the connecting mechanism becomes disarranged or broken. The normal position of all signals is at danger, excepting the dwarf signal 18, which indicates clear when in a normal position. In all cases the semaphore arm points to the right of the track it governs.

The home signal for each track is located at the distance from the crossing shown on Plate No. 2, and is connected to the tower by a pipe line. It is located on the engineer's side of the track it governs on the Illi-

noir Central, and on the right hand side of the track, facing the crossing, on the Wabash and the Big Four. When the derail or facing point is set against train movements, governed by the home signal, the signal is locked in a horizontal position and shows a red light at night, indicating danger. When the track it governs is clear for the passage of trains, the signal will be inclined at an angle of 60 degrees and will show a white light at night. Where two semaphore arms are used on the same post, the top signal governs the main line, and the lower signal either a diverging route or backward movements.

The distant signal is located 2000

feet from the crossing, and is connected to the home by means of wire lines. It is located on the same side of the track as the home signal with which it operates. And has the arm pointing in the same direction. The distant signal is distinguished from the home signal by a notch cut in the end of the semaphore arm. It is so arranged that it will be held in a horizontal position and show a greenlight at night, when the home signal is at danger.

Dwarf signals have a small arm placed at a suitable height, and are similar in design to the home signal, but are used only to

power movements on Secondary tracks.

COMPENSATORS.

Each line of pipe is automatically compensated. The compensators are located at such intervals in the line as to completely provide for expansion and contraction at various temperatures. The wire lines also are provided with automatic compensators, and in addition have a sleeve-nut at each end capable of making a total adjustment of twelve inches.

DETECTOR BARS.

All derails, facing points, switches, and crossing are provided with detector

bars fifty feet in length. Those used in connection with the working switches and derails are operated by the same lever which operates the switch or derail. The first interval of the lever movement withdraws the locking pin and raises the detector bar; the second interval of the movement throws the switch; and the final movement drops the detector bar to its original position and replaces the locking pin.

FOUNDATIONS.

The combination cast-iron and wood foundation, manufactured by the Standard Railroad Signal Co. will be used for all compensators, cranks, dwarf signals, pipe carriers,

and chain wheels. The high signals will be set in concrete foundations. All wood coming in contact with the ground will be painted with coal tar.

SIGNAL POSTS

The standard steel signal pole manufactured by the Standard Railroad Signal Co., will be used for the home and distant signals. These signal posts are set eight feet clear of the rail.

TOWER.

The tower is placed half way between the Big Four and the Stabash tracks and ten feet west of the Illi-

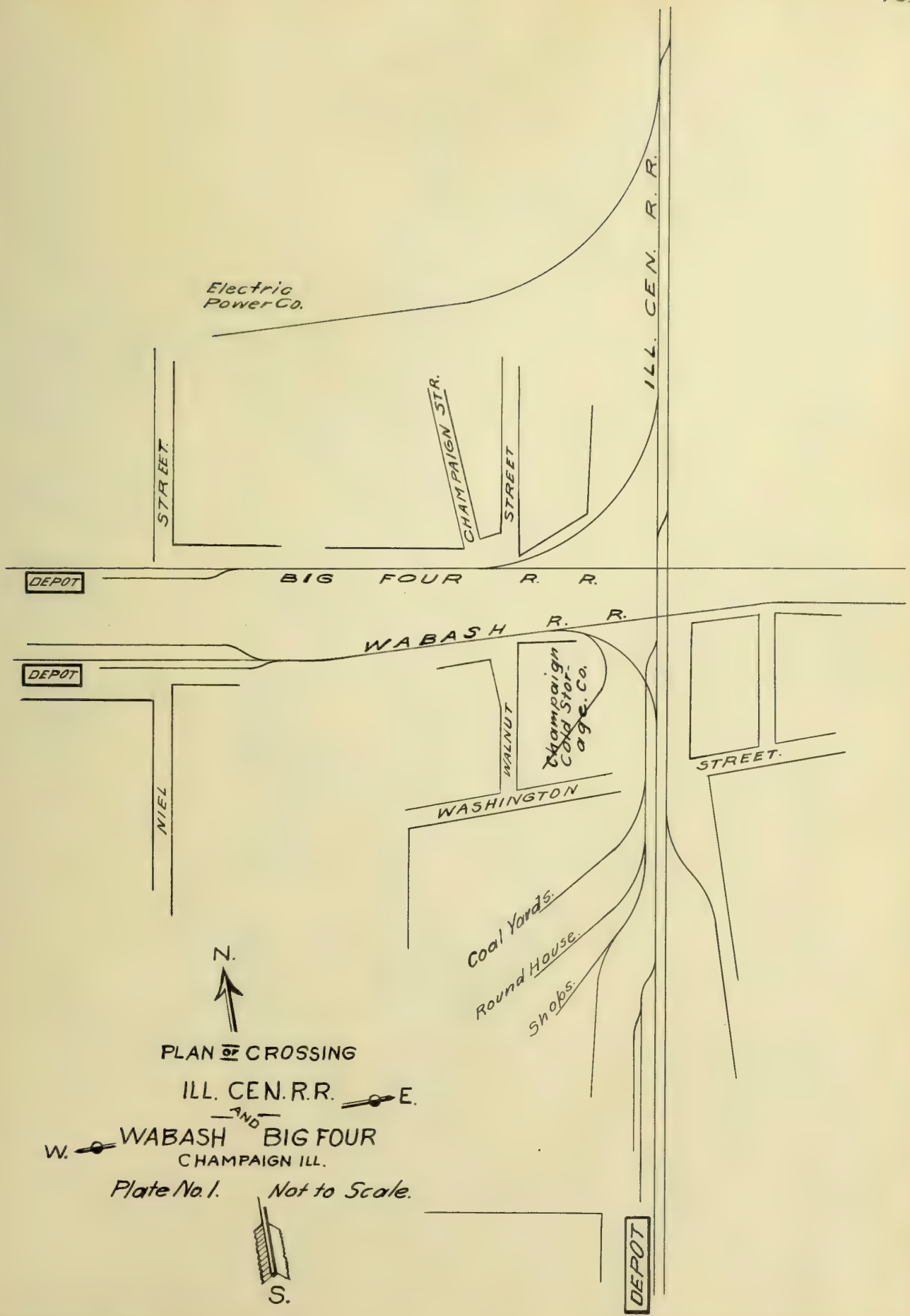
nois central south bound main track. The dimensions of the ground plan are 16 by 20 feet and the tower is to be 20 feet in height.

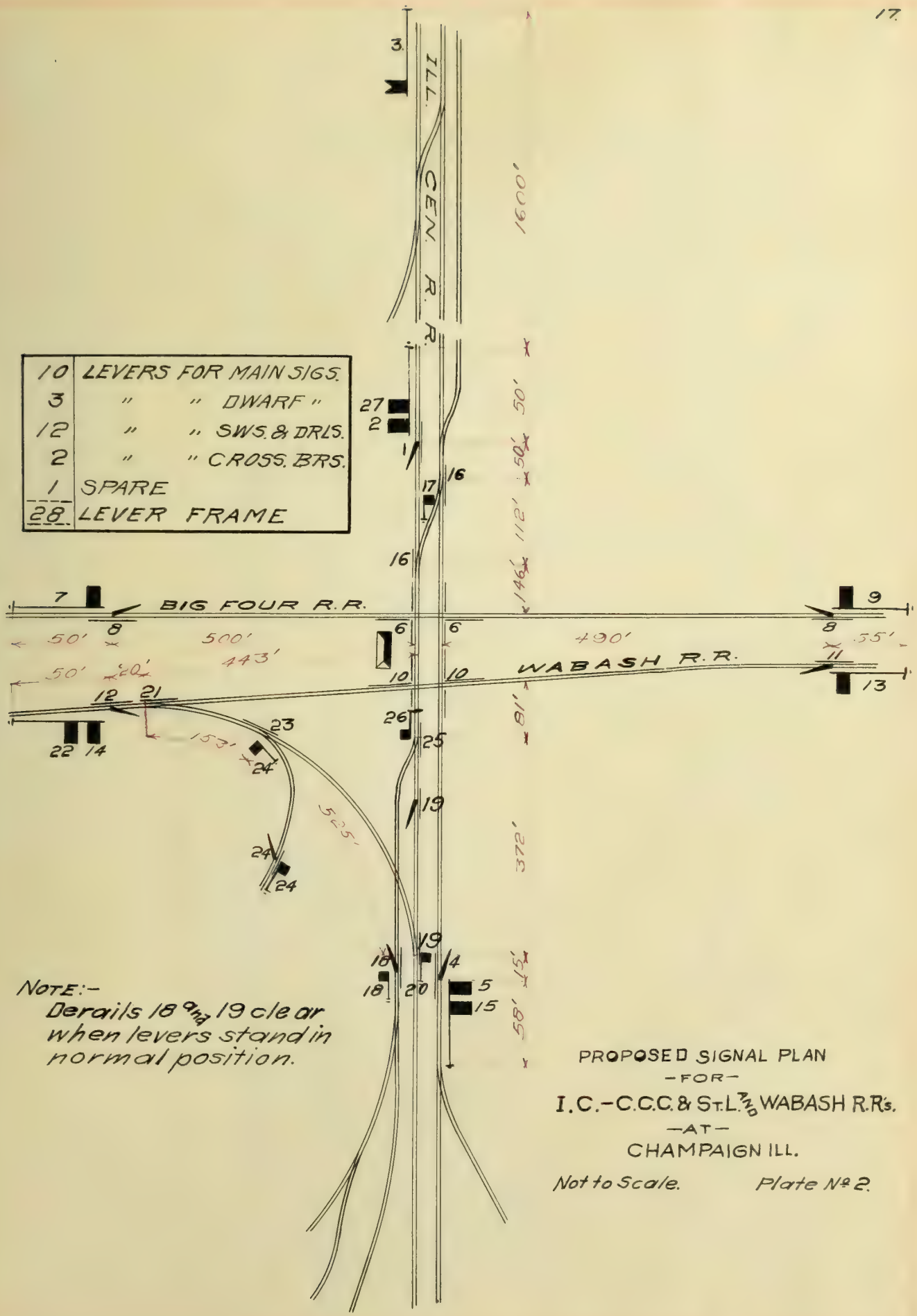
PAINTING.

All iron work and piping is to be painted with two coats of red lead mixed with linseed oil, and finished with a suitable coat of black. The levers of the interlocking machine are painted according to their use as follows:- switch and derail levers black; detector bar levers yellow; home signal levers red; distant signal levers green; and dwarf signal levers blue.

SECONDARY AND OUTLYING SWITCHES.

All switches in the coal yards and those leading to the round house are operated from the tower by means of one horse power electric motors. They are not interlocked with the main system but are operated from the tower in order to facilitate switching in the yards.


Electric Power Co.
ILL. CEN. R. R.
STREET
CHAMPAIGN STR.
STREET
DEPOT
BIG FOUR R. R.
WABASH R. R.
DEPOT
Champaign Cold Storage Co.
WALNUT
WASHINGTON
NIEL
STREET.
Coal Yards.
Round House.
Shops.
DEPOT
N.
S.
PLAN OF CROSSING
ILL. CEN. R.R.
AND
WABASH BIG FOUR
CHAMPAIGN ILL.
E.
W.
Plate No. 1.
Not to Scale.



10	LEVERS FOR MAIN SIGS.
3	" " DWARF "
12	" " SWS. & DRLS.
2	" " CROSS. BRS.
1	SPARE
28	LEVER FRAME

NOTE:-
Derails 18 & 19 clear when levers stand in normal position.

PROPOSED SIGNAL PLAN
-FOR-
I.C.-C.C.C. & St.L. & WABASH R.R's.
-AT-
CHAMPAIGN ILL.

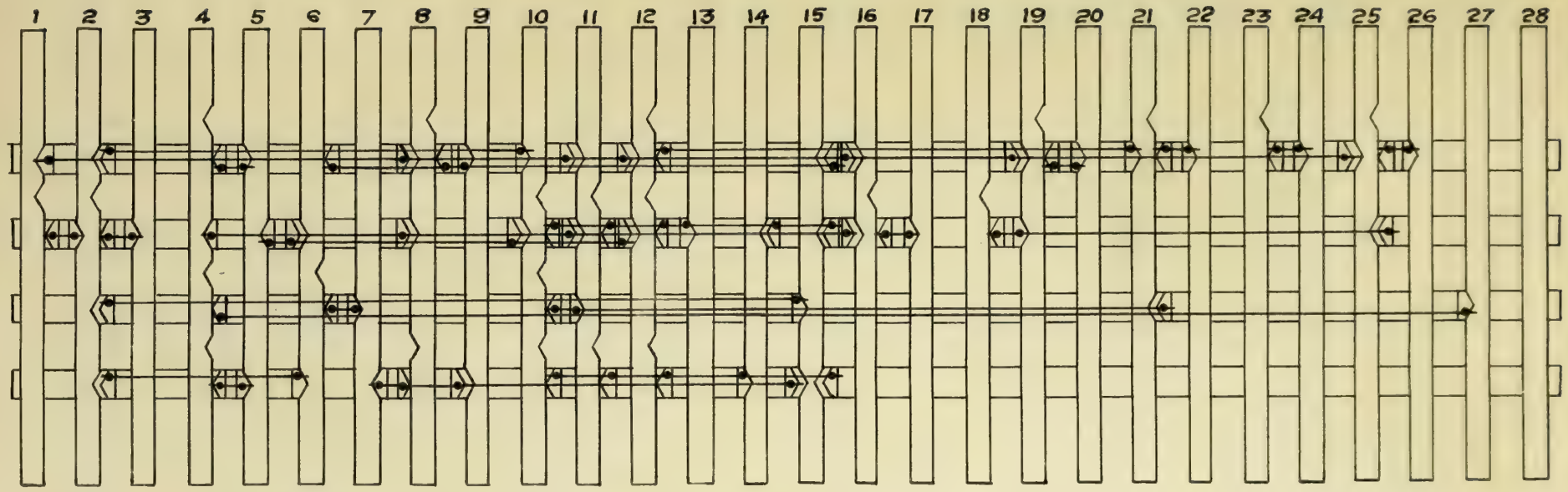
Not to Scale. Plate No 2.

PLATE Nº 3.

LOCKING SHEET

LEVER	LOCKS
(1)	8 11 12 16 19 25
(2)	(1) 6 10 15
(3)	(2)
(4)	8 11 16
(5)	(4) 6 10 12
(6)	2 5
(7)	(8) 9 15 (6)
(8)	1 4
(9)	(8) 7 15 (6)
(10)	2 5
(11)	1 4 (10) 21
(12)	1 5
(13)	(11) 14 15 (12) (10)
(14)	(12) 13 15 (11) (10)
(15)	2 7 9 13 14
(16)	1 4
(17)	(16)
(18)	
(19)	(18) 25 1
(20)	(19)
(21)	11 (12)
(22)	(21)
(23)	
(24)	(23)
(25)	1 19
(26)	(25)
(27)	(4)
(28)	

NOTE:- Numbers in parenthesis indicate that lever is in a reversed position.



DOG SHEET

-FOR-

INTERLOCKING PLANT

—AT—

CHAMPAIGN ILL.

Plate Nº 4.

19

PLATE Nº 5.

MANIPULATION SHEET

ILLINOIS CENTRAL NORTH	
N.B. Main Trk.	(4) (5) 6 8 10 11 12 16
S.B. Main Trk.	(15) 2 7 9 13 14
S.B. Mn. Trk. to Cros. Ovr.	(15) (16) (17) / 2 4 7 9 13 14
Coal Yds. to S.B. Mn. Trk.	(25) (26) / 18 19
S.B. Mn. Trk. to Transfr. Trk.	(18) (19) (20) (21) (22) (12) / 11 25
ILLINOIS CENTRAL SOUTH	
S. B. Main Trk.	(1) (2) (3) 6 8 10 11 12 15 16 19 25
N. B. Main Trk.	(4) (27) 8 11 16
N.B. Mn. Trk. to Cros. Ovr.	(16) (17) / 4
N.B. Mn. Trk to Coal Yds.	(25) (26) 18 / 19
BIG FOUR WEST	
Main Track	(6) (8) (9) / 4 7 15
BIG FOUR EAST	
Main Track	(6) (7) (8) / 2 4 5 7 15
WABASH WEST	
Main Track	(10) (11) (12) (13) / 2 4 5 14 15 21
WABASH EAST	
Main Track	(10) (11) (12) (14) / 2 4 5 13 15 21
Mn. Trk. to Transfr. Trk.	(12) (18) (19) (20) (21) (22) / 11 25